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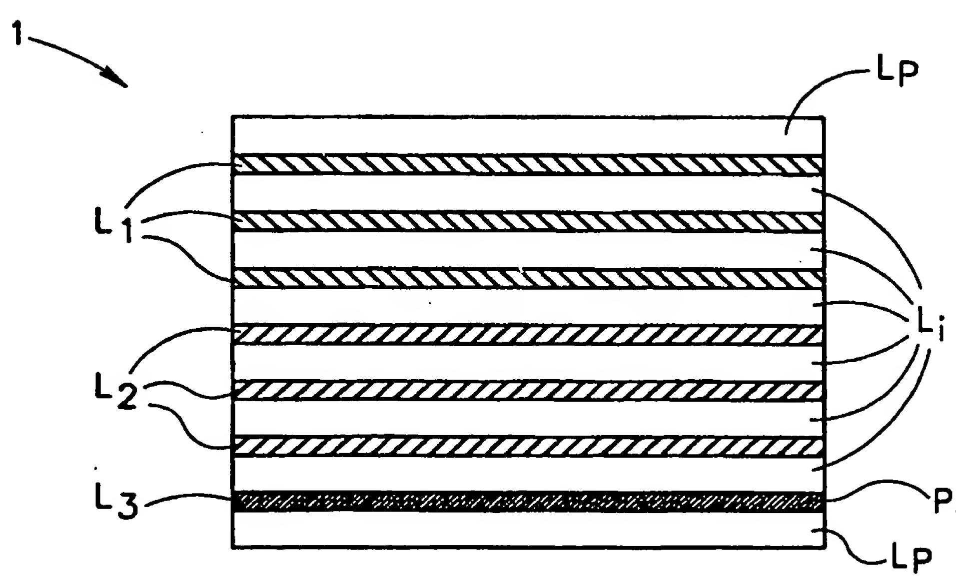

(57) Abstract

A three–dimensional information carrier is presented. The information carrier comprises at least two information layers that are of different types with respect to recording data therein. At least one of the at least two information layers is adapted for recording data therein, and at least one of the at least two information layers comprises a substantially fluorescent material. The fluorescent material is capable of producing output fluorescent radiation, when interacting with a predetermined incident radiation.

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A Three-Dimensional Information Carrier

FIELD OF THE INVENTION

This invention is in the field of high density and high capacity storage devices and relates to a three-dimensional information carrier, such as compact discs (CD), tapes, cards, or the like, in which information is recorded and read out by optical means.

BACKGROUND OF THE INVENTION

Optical discs are known memory devices which are widely used particularly with playback and computer devices for retrieving musical and software compositions. Conventional optical discs are of three kinds: Read Only Memory (ROM), Recordable Memory or so-called *"Write-Once-Read-Many"* (WORM), and Rewritable Memory. Each of these disks typically comprises only one information-carrying layer and, therefore, suffers from a limited amount of recorded data. ROM typically includes a grooved substrate and a reflecting metal layer formed thereon. WORM includes a low melting temperature metal layer coated on a substrate. The rewritable disk includes a recording layer made of a phase changeable material.

Three-dimensional information carriers, such as optical disks or optical cards, have been developed to significantly increase the amount of stored information, as compared to conventional two-dimensional optical memory

devices. The capacity of a three-dimensional optical memory device is proportional to the third order of a reading radiation wavelength. For example, the total thickness of a three-dimensional optical memory device can be of 1 mm and can be formed of information layers having a thickness of 0.01 mm. The storage capacity of such a device would be 100 times greater than the capacity of a single layer.

A three-dimensional optical memory device is disclosed for example in U.S. Patent No. 4,090,031. This device comprises a substrate and a plurality of data layers provided on one side of the substrate. Each of the layers comprises data tracks formed of lines of data spots. The data spots are formed of either binary coded digital information, or frequency or pulse length modulated analog information, which is photographically recorded. The data spots are formed of radiation-reflective metal material having a reflection index different from that of the data layers.

However, conventional reading techniques fail to successfully read out the information stored in such a "reflective" information carrier having more than two data layers, owing to unavoidable multiple reflection and diffraction that occur at the upper and lower information layers, when accessing them with an incident radiation. This results in undesirable crosstalk between the data regions of different layers, affecting the signal-to-noise ratio. In fact, the single commercially available three-dimensional optical disk known as DVD, comprises two information-carrying layers.

One of the main goals of the computer industry is directed towards minimizing the weight and dimensions of the personal computer. These parameters of the personal computer strongly depend on the weight and dimensions of the high density and high capacity memory device used therein. Unfortunately, the above disadvantages of the "reflective" multilayer optical disks prevent them from replacing conventional magnetic hard disks, which

are definitely heavier, larger and more expensive, as compared to the optical disks.

SUMMARY OF THE INVENTION

There is accordingly a need in the art to improve conventional optical memory devices by providing a novel three-dimensional information carrier combining the properties of read-only, write-once and rewritable memory devices.

There is thus provided according to one aspect of the present invention, a three-dimensional information carrier comprising at least two information layers that are of different types with respect to recording data therein, wherein at least one of said at least two information layers is adapted for recording data therein, at least one of said at least two information layers comprises a substantially fluorescent material capable of producing output fluorescent radiation when interacting with a predetermined incident radiation.

The main idea of the present invention is based on the following. The information carrier is composed of at least two functionally different information layers, i.e. different types with respect to recording the data therein. To this end, at least one of the layers comprises a fluorescent material capable of producing an output fluorescent radiation when interacting with a predetermined incident radiation.

The at least one recording layer may be a data rewritable type information layer. In this case, the at least one layer comprising the fluorescent material may be a write-once type information layer, or a read-only information layer. The at least one recording layer may be a write-once type information layer, in which case, the at least one layer comprising the fluorescent material may be a rewritable type information layer, or a read-only information layer.

According to another embodiment of the invention, the information layer comprises at least one read-only type information layer, at least one write-once type information layer, and at least one rewritable type information layer. Preferably, the at least one write-once information layer is located between the at least one read-only type information layer and the at least one rewritable type information layer.

According to another aspect of the present invention, there is provided an information processing system comprising the above information carrier and a driver associated therewith for reading and writing data therein.

More specifically, the present invention is used with an optical disk as an information carrier and is therefore described below with respect to this application. However, the same may be applied to optical tapes, cards or the like three-dimensional structures.

BRIEF DESCRIPTION OF THE DRAWINGS:

In order to understand the invention and to see how it may be carried out in practice, a preferred embodiment will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic cross-sectional view of an information carrier constructed according to one embodiment of the invention;

Figs. 2a and 2b illustrate two examples, respectively, of the construction of a read-only type information layer in the carrier of Fig. 1;

Figs. 3a and 3b are cross-sectional views of a write-once type information layer suitable for the carrier of Fig. 1, constructed according to one example of the invention, illustrating, respectively, two operational positions of the carrier;

Fig. 4a is a cross sectional view of a write-once type information layer suitable for the carrier of Fig. 1, constructed according to another example of the invention;

Fig. 4b is a cross-section of Fig. 3a taken along a line A-A;

Fig. 5 is a graphical illustration of typical absorption spectra of a photochromic material used in the information carrier of Fig. 1;

Fig. 6 illustrates an information processing system utilizing the information carrier of Fig. 1.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to Fig. 1 there is illustrated an optical disk (constituting an information carrier), generally designated **1**, constructed according to one embodiment of the invention. The disk **1** is composed of a plurality of parallel spaced-apart information layers of three different types, generally at $\mathbf{L_1}$, $\mathbf{L_2}$ and $\mathbf{L_3}$. Layers $\mathbf{L_1}$ are of a read-only type, layers $\mathbf{L_2}$ are of a write-once type and layer $\mathbf{L_3}$ is of a rewritable type. Intermediate layers, generally at $\mathbf{L_I}$, are provided between each two adjacent information layers, and two protective layers $\mathbf{L_p}$ are provided at opposite sides of the disk **1**. The intermediate layers $\mathbf{L_i}$ and protective layers $\mathbf{L_p}$ are formed of a substantially optically transparent material. The thickness of each information layer is approximately 0.3-20μm, while the thickness of each intermediate layer is approximately 5-500μm.

Fig. 2a illustrates one example of the read-only type information layers $\mathbf{L_1}$ according to the invention. Information stored in the layer $\mathbf{L_1}$ is in the form of a pattern having a plurality of spaced-apart recording regions, generally at $\mathbf{R_{rec}}$ containing fluorescent material, for example organic fluorescent dye. The recording regions $\mathbf{R_{rec}}$ are spaced by surrounding, substantially optically transparent regions $\mathbf{R_t}$.

According to another example, illustrated in Fig. 2b, each recording region $\mathbf{R'_{rec}}$ is in the form of a stack comprising three layers $\mathbf{L_{fl}}$, $\mathbf{L_{ref}}$ and $\mathbf{L_{ab}}$,

formed of, respectively, fluorescent, reflective and absorbing materials with respect to a predetermined radiation spectrum. Thus, the layers L_{fl} and L_{ref}, when illuminated by an incident radiation within this predetermined spectrum, would produce fluorescent and reflected output radiation, respectively. The reflective layers L_{ref} serve as mirrors attached to each fluorescent layer L_{fl}. The provision of such a reflective material underneath the fluorescent material, on the one hand, increases the fluorescent properties of the layer L_{fl}. The provision of the absorbing layer L_{ab} eliminates an undesirable cross-talk between the adjacent recording regions, when reading information stored in the layers L_1.

Multilayer read-only memory devices exemplified in Figs. 2a and 2b and methods of their manufacture are disclosed in U.S. Patent Applications Nos. 08/956,052 and 08/944,402, assigned to the assignee of the present application.

Reference is made to Figs. 3a and 3b, illustrating one possible example of the write-once type layers L_2 in its two operational positions, respectively. Initially, i.e. in a ready-to-write position of the layer L_2, this layer has no pattern and is made of a fluorescent material **FM** (Fig. 3a). Information in the form of a pit-like pattern is recorded by appropriately scanning the layer with a laser beam, producing recording fluorescent regions R_{rec} spaced by surrounding bleached regions R_{bl} (Figs. 3b).

Turning now to Fig. 4a, each of the write-once layers L_2 in its ready-to-write position has a pattern in the form of spiral or spaced parallel concentric circles, generally at **CS**, made of a fluorescent material and surrounded by transparent regions R_t. Fig. 4b illustrates a so-called "recorded" position of the layers L_2, taken as a cross-section of Fig. 4a along the line **A-A**. The fluorescent spirals or circles are now patterned by spaced-apart bleached regions R_{bl}.

The write-once layers may be manufactured by any suitable known technique, for example such as disclosed in U.S. Patent Applications Nos. 08/989,460, 08/989,461 and 08/989,172 assigned to the assignee of the present application.

Turning back to Fig. 1, the rewritable information layer $\mathbf{L_3}$ is made of an active medium formed of photochromic-fluorescent compound, generally at **PF**. A photochromic material is typically characterized by two isometric phases $\boldsymbol{A}$ and $\boldsymbol{B}$ (fluorescence). By absorbing a photon, the molecule in the phase $\boldsymbol{A}$ is transferred to the phase $\boldsymbol{B}$. The light absorption in the phase $\boldsymbol{B}$ results in the fluorescence and back transfer to the phase $\boldsymbol{A}$.

Fig. 5 graphically illustrates a typical absorption spectra for a photochromic material inserted in a transparent polymer having both phases $\boldsymbol{A}$ and $\boldsymbol{B}$. Two lobes **GA** and **GB** represent the absorption intensity $\mathbf{I_{abs}}$ of phases $\boldsymbol{A}$ and $\boldsymbol{B}$, respectively, as a function of wavelength λ. The reversible chemical transition $\boldsymbol{A} \leftrightarrow \boldsymbol{B}$ has an isobestic point λ_0, where the probabilities of direct transfer $\boldsymbol{A} \rightarrow \boldsymbol{B}$ process and backward transfer $\boldsymbol{B} \rightarrow \boldsymbol{A}$ process are equal. Photoinduced chemical transition from phase $\boldsymbol{A}$ to phase $\boldsymbol{B}$ represents the writing process. Fluorescence of the phase B illuminated by a laser beam represents the reading process. Back transition from the phase $\boldsymbol{B}$ to the phase $\boldsymbol{A}$ is the information erasing process. Generally, the rewritable layer $\mathbf{L_3}$ may be manufactured by any known suitable technique, for example used for manufacturing CD-RW74 commercially available from Maxell.

Thus, the information is written in the layer $\mathbf{L_3}$ by simply focusing a laser beam of a predetermined wavelength range onto a selected location. The binary information is recorded by transferring the photochromic molecules located in the illuminated region, from the inoperative, non-luminescent isometric phase $\boldsymbol{A}$ to operative luminescent isometric phase $\boldsymbol{B}$, and by varying the fluorescence efficiency (or the amount of fluorescent material) within the illuminated area. Later illumination of these selected regions by a focused

laser beam of another appropriate wavelength range causes only the phase ***B*** molecules to luminescent. This luminescence is detected as the stored binary data. The stored data can be erased either by heating or by uniformly illuminating the layer $\mathbf{L_3}$, for example by a suitable laser.

The wavelength selection for writing/reading/erasing processes is based on the following. In order to prevent the writing/erasing process correlation, the operational laser spectrum should be within the "left" part of the phase *A* absorption band. For the erasing process, the proper wavelength should be at the maximal absorption bandwidth of the phase ***B***. In order to prevent the erasing process while reading the information, the reading wavelength should be shifted to the "right" side of the phase ***B*** absorption band.

The manufacture of information disk **1** may utilize the mechanical replication, using injection molding of a policarbonate disk substrate formed with the above-described cells-like or spiral-like pattern. The cells and spirals are then filled with the fluorescent material, using spin-coating, dipping or other suitable techniques. The substrate surface is cleaned from the remaining fluorescent material located out of the cells or spiral, and many substrates so processed are glued together to form the multilayer fluorescent information disk **1**. Alternatively, disk **1** may be manufactured using photolithography, holography or other optical replication methods. Reading information stored in disk **1** is accomplished using various fluorescent reading/recording devices disclosed in co-pending applications assigned to the assignee of the present application. The construction and operation of such a pick-up device does not form a part of the present invention and need not be specifically described, except to note the following. During the reading procedure, the disk **1** is rotated relatively fast, relative to that of the recording procedure, and no changes in the disk structure is observed due to relatively small interaction time between the reading radiation and the disk, and relatively low power of

the reading laser. The disk **1** rotates sufficiently slowly during the recording procedure, so as to provide enough time for reduction of the fluorescent signal by heating or bleaching the fluorescent material. The recording procedure can be performed also by a special, high power, recording device.

The main principles underlying the implementation of the multilayer disk **1**, in distinction to the conventional three-dimensional (i.e. two-layer) DVD, are based on the fact that substantially no-reflection occurs when reading in the disk. The reading radiation and output radiation to be detected are within different spectrums. Hence, the disk **1** has the following advantageous features:

1) the depth accuracy of the recording regions $\mathbf{R}_{rec}$ – 200nm;
2) the number of gray levels inside the recording regions $\mathbf{R}_{rec}$ – up to 10;
3) the number of information layers to be read out – 2-50;
4) storage capacity – 5-250GB;
5) signal-to-noise ratio is very intensive, irrespective of the number of information layers;
6) signal contrast – 5-100;
7) the diameter of the focused laser beam – arbitrary, i.e. irrespective of the width of a recording region;
8) light source may be either coherent or non-coherent;
9) no metal surface is required, and consequently the disk lifetime has no limitation associated with the metal surface corrosion;

Reference is now made to Fig. 6 illustrating a processing system, generally designated **10**, constructed generally similar to conventional systems of this kind, but utilizing the disk **1** as an information carrier. The system **10** comprises a computer unit **12** and a display unit **14**. The disk **1** is associated with a suitable drive **16**, which is either an external device coupled to the computer unit **12** in a conventional manner or is integral with the unit

12. The disk **1** may replace a conventional magnetic hard disk or be used in addition thereto as a separate memory device. The construction and operation of the disk drive **16** do not form the part of the present invention and need not be specifically described, except to note the following. This drive includes a suitable optical head and a driving means for rotating the disk about its axis and providing a relative displacement between the disk and the optical head to read/record/erase the information in an addressed information layer. The optical head includes a laser source, a light directing optics, a focus-error correction unit and a detection unit. These elements may be arranged and constructed as described in the above-mentioned co-pending applications assigned to the assignee of the present application.

It should be noted that the disk **1** may comprise one of the following layers' combination:

- at least one read-only type layer $\mathbf{L_1}$ and at least one write-once type layer $\mathbf{L_2}$;
- at least one read-only type layer $\mathbf{L_1}$ and at least one rewritable type layer $\mathbf{L_3}$;
- at least one write-once type layer $\mathbf{L_2}$ and at least one rewritable type layer $\mathbf{L_3}$;
- at least one read-only type layer $\mathbf{L_1}$, at least one write-once type layer $\mathbf{L_2}$ and at least one rewritable type layer $\mathbf{L_3}$.

Read-only type layers $\mathbf{L_1}$ may be used for storing information requiring no user intervention, such as multimedia, games, audio- and/or video-guides, dictionaries, photo-collections, computer operational systems such as DOS, Windows, etc. In the combination of the three types of layers, write-once type layer $\mathbf{L_2}$ may be used for storing complete versions (or an archive) of those files that were initially edited (i.e. recorded) and duly updated in the rewritable type layer $\mathbf{L_3}$. These files, once being completed in the rewritable layers $\mathbf{L_3}$, are then transferred by the user to the write-once layers $\mathbf{L_2}$ to be

archived there, thereby vacating "space" for new files to be written in the layers L_3.

The disk **1** has the capacity of more than 5GB, and therefore allows for recording therein about 1000 highest quality professional images. More then 10,000 fine images (1E6 pixels) can be stored within a single carrier. The carrier enables the storage of non-compressed format, thereby reducing the electronics of the entire system using the same, e.g. computer system, digital photo and video camera, etc.

High capacity (about 100GB) is usually required for convenient storage of large information volumes. Indeed, conventional CD-ROM and DVD formats require simultaneous use of several disks and drives for this purpose. It is often the case that transportation and storage of such amounts of information utilize disks owing to their high overall rate, reliability, low cost, constant access and compactness. The above construction of disk **1** solves all these problems.

The information carrier **1** may be in the form of a card, having the capacity of 0.1-1GB and the card storage area of 20-40mm. The card may be flexible and suitable for portable storage as a memory card for various applications, such as credit card, identification smart card, medical/health memory card, audio player, storage for portable computers, hand held computers, portable faxes, radio and telecommunication devices, digital photography, TV glasses, etc.

The carrier **1** may be in the form of a micro-disk having the capacity of 1-10GB and the diameter of 20-40mm. Such a disk is suitable for applications in which dimensions and weight of the entire system utilizing the disk are critical.

The carrier **1** may be in the form of a disk having the capacity of 10-100GB, and a diameter of 60-120mm, similar to a conventional CD-ROM or DVD. The carrier **1** having a significantly larger capacity, about 0.2-10TB

and a diameter of 250-500mm may be used in various industrial and commercial applications, where the capacity of the memory device is the most critical parameter, e.g. remote memory, libraries, space satellites, etc.

A handheld computer is a relatively new generation in the computer industry. It was designed to provide users with a computing system much more portable than regular laptops. Today, the main limitation of the handheld computer is associated with the dimensions and weight of a storage means suitable to be used therein. In practice, the conventional high capacity storage means cannot be used with the handheld computer, thereby significantly limiting its functions and consequently the use thereof.

The information carrier **1**, constructed as described above, could solve the above problem by presenting all known functions of high capacity storage means, such as the magnetic hard disk, whilst being relatively light, small and inexpensive. Due to the advantageous features of the three-dimensional fluorescent information carrier, the above-described processing system could be easily modified by providing an appropriate means capable of replacing one such carrier, completely occupied with the storied information, by a new one. The replaced carrier could be used as an external, archive-like information carrier. The information carrier according to the invention could be used in various intelligent systems.

Those skilled in the art will readily appreciate that many modifications and changes may be applied to the invention as hereinbefore exemplified without departing from its scope defined in and by the appended claims. For example, the information carrier may be in the form of disk, card, tape, etc. It may be used in various information processing systems, such as computers, imaging and communication systems, etc.

CLAIMS:

1. A three-dimensional information carrier comprising at least two information layers that are of different types with respect to recording data therein, wherein at least one of said at least two information layers is adapted for recording data therein, at least one of said at least two information layers comprises a substantially fluorescent material capable of producing output fluorescent radiation, when interacting with a predetermined incident radiation.

2. The carrier according to Claim 1, wherein the at least one recording layer is a data rewritable type information layer.

3. The carrier according to Claim 1, wherein the at least one recording layer is write-once type information layer.

4. The carrier according to Claim 1, wherein the at least one layer comprising said fluorescent material is read-only type information layer.

5. The carrier according to Claim 2, wherein said at least one layer comprising the fluorescent material is a write-once type information layer.

6. The carrier according to Claim 2, wherein said at least one layer comprising the fluorescent material is a read-only type information layer.

7. The carrier according to Claim 3, wherein said at least one layer comprising the fluorescent material is a read-only type information layer.

8. The carrier according to Claim 1, wherein the at least one recording layer comprises a material capable of producing output fluorescent radiation when interacting with a predetermined incident radiation.

9. The carrier according to Claim 1, and also comprising at least one additional layer, which is of a different type with respect to recording data therein, as compared to said at least two layers.

10. The carrier according to Claim 9, wherein at least one of said at least two layers is a read-only type information layer, at least one other layer

of said at least two layers is write-once type information layer, and said at least one additional layer is a rewritable type information layer.

11. The carrier according to Claim 10, wherein said at least one write-once information layer is located between said at least one read-only type information layer and said at least one rewritable type information layer.

12. The carrier according to Claim 9, wherein each of said at least one read-only type information layer and of said at least one write-once information layer comprises said material capable of producing output fluorescent radiation when interacting with a predetermined incident radiation.

13. The carrier according to Claim 1, wherein said material is in the form of cells surrounded by substantially optically transparent material with respect to said incident and output radiation.

14. The carrier according to Claim 13, wherein said at least one layer comprising the fluorescent material is a read-only type information layer.

15. The carrier according to Claim 1, wherein said material is in the form of a data track formed in an optically transparent material with respect to said incident and output radiation.

16. The carrier according to Claim 15, wherein said at least one layer comprising the fluorescent material is a write-once type information layer.

17. The carrier according to Claim 15, wherein said at least one layer comprising the fluorescent material is a rewritable type information layer.

18. The carrier according to Claim 1, wherein said fluorescent material is distributed within the entire volume of at least one layer comprising the fluorescent material.

19. The carrier according to Claim 18, wherein said at least one layer comprising the fluorescent material is a write-once type information layer.

20. The carrier according to Claim 18, wherein said at least one layer comprising the fluorescent material is a rewritable type information layer.

21. The carrier according to Claim 9, wherein said material is in the form of cells surrounded by substantially optically transparent material with respect to said incident and output radiation.

22. The carrier according to Claim 21, wherein said at least one layer comprising the fluorescent material is a read-only type information layer.

23. The carrier according to Claim 9, wherein said material is in the form of a data track formed in an optically transparent material with respect to said incident and output radiation.

24. The carrier according to Claim 23, wherein said at least one layer comprising the fluorescent material is a write-once type information layer.

25. The carrier according to Claim 23, wherein said at least one layer comprising the fluorescent material is a rewritable type information layer.

26. The carrier according to Claim 9, wherein said fluorescent material is distributed within the entire volume of at least one layer comprising the fluorescent material.

27. The carrier according to Claim 25, wherein said at least one layer comprising the fluorescent material is a write-once type information layer.

28. The carrier according to Claim 25, wherein said at least one layer comprising the fluorescent material is a rewritable type information layer.

29. The carrier according to any one of Claims 1 or 9, wherein said information carrier is a disk.

30. The carrier according to any one of Claims 1 or 9, wherein said information carrier is a card.

31. An information processing system comprising an information carrier according to Claim 1, the system comprising a driver associated with said information carrier for reading and writing data therein.

32. The system according to Claim 31, wherein said information carrier is an external memory device.

33. The system according to Claim 31, wherein said information carrier is an internal memory device.

34. The system according to Claim 31, wherein said system is a hand held computer.

35. The system according to Claim 31, wherein said system is an imaging system.

36. The system according to Claim 31, wherein said system is a communication system.

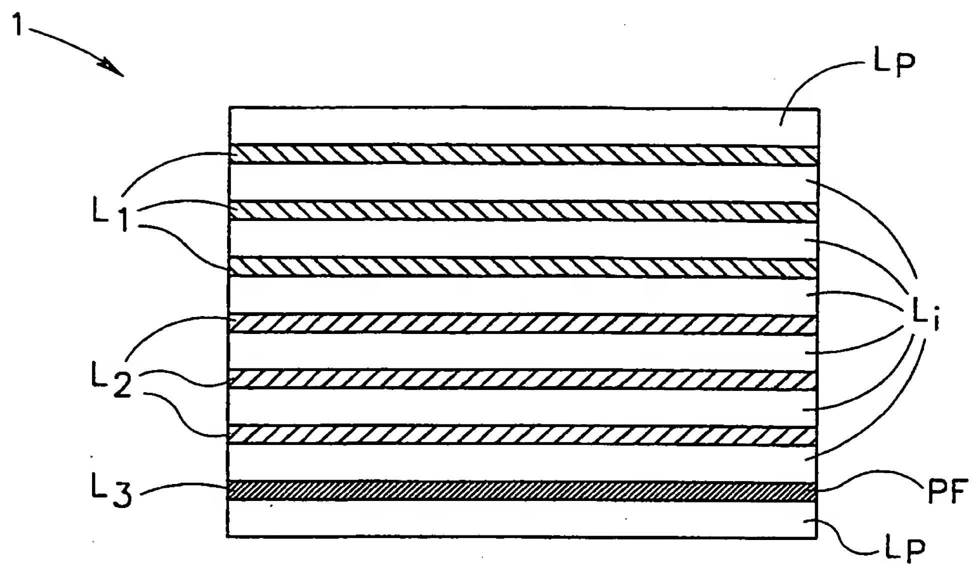

FIG.1

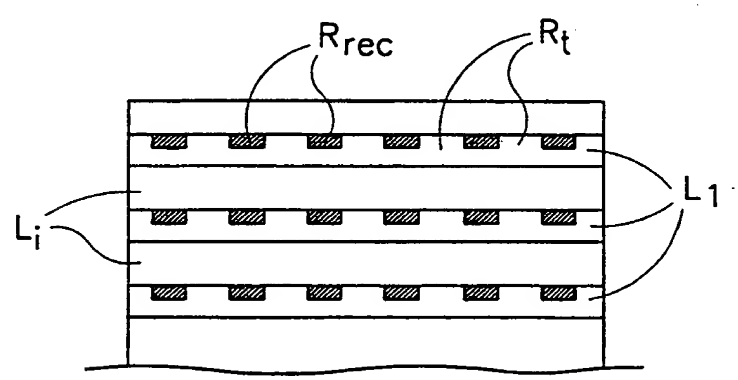

FIG.2A

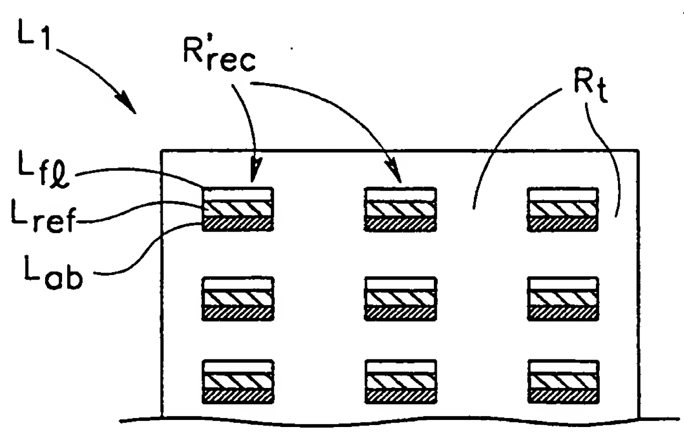

FIG.2B

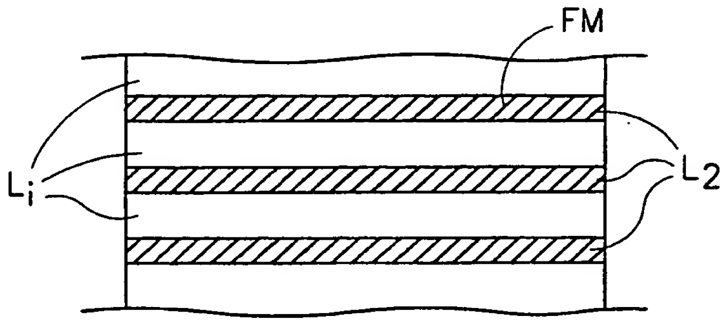

FIG.3A

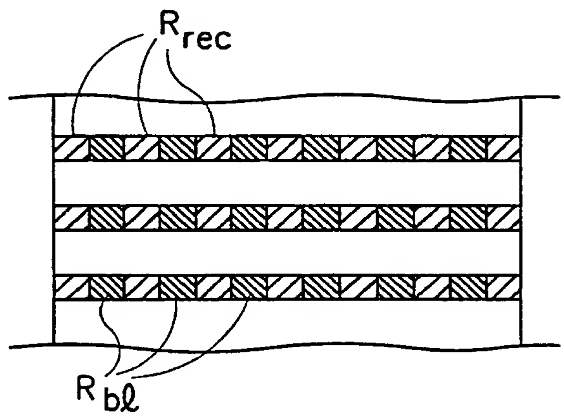

FIG.3B

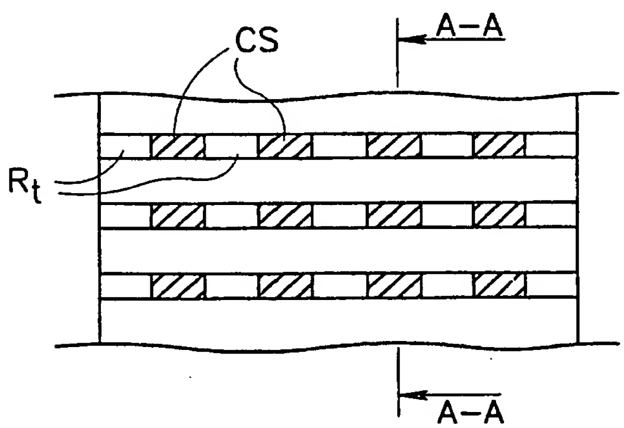

FIG.4A

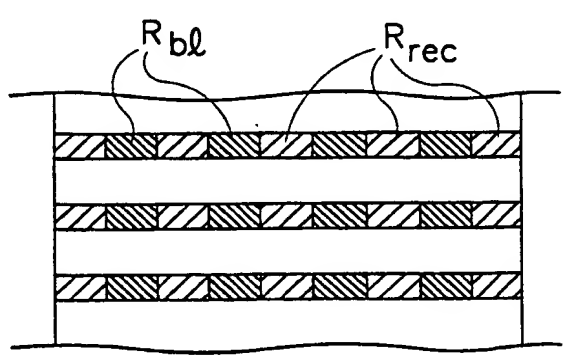

FIG.4B

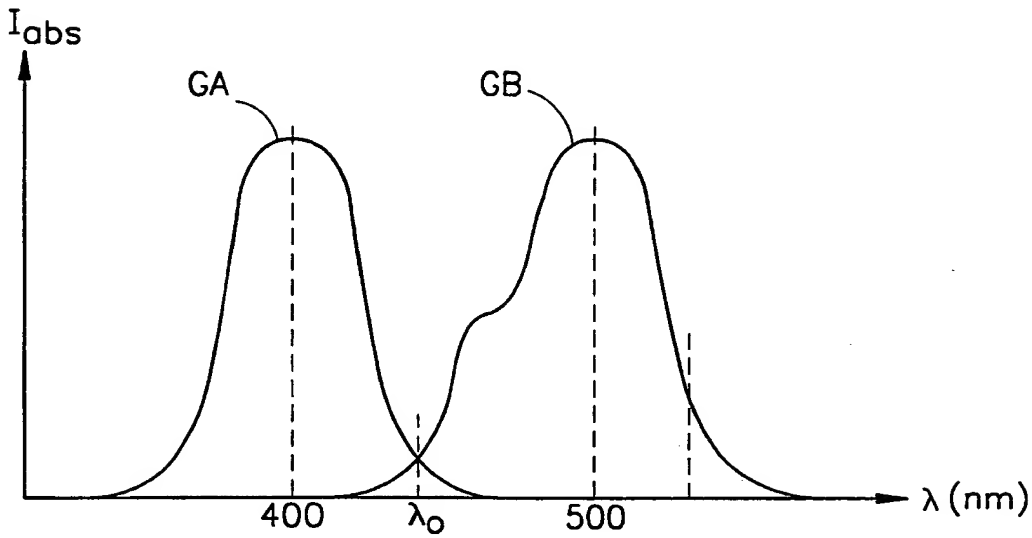

FIG.5

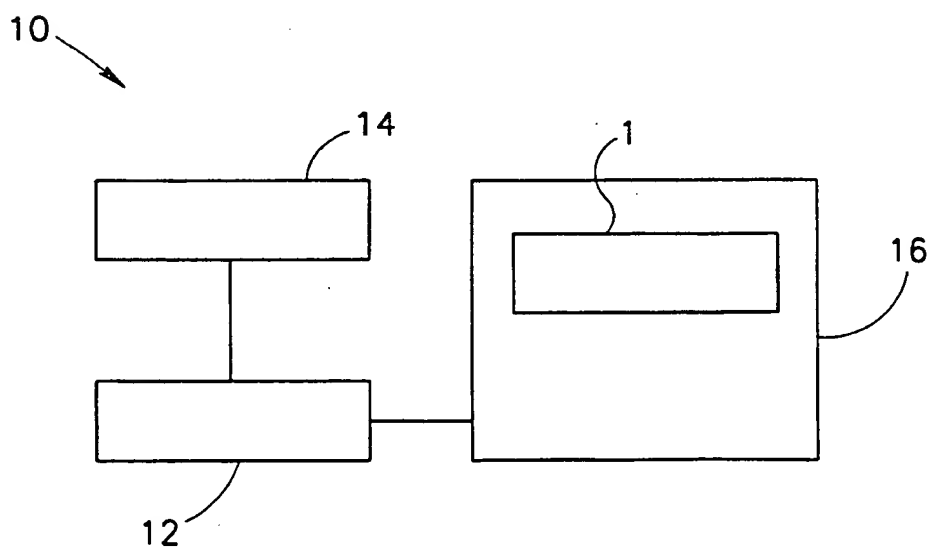

FIG.6

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IL 98/00535

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G11B7/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 44 44 988 A (WENDT ULRICH DR RER NAT HABIL) 20 June 1996 see the whole document	1-9,13, 14,21, 22,29,30
A		10-12, 15-20, 23-28
X	EP 0 164 577 A (TOKYO SHIBAURA ELECTRIC CO) 18 December 1985 see page 23, line 14 - page 25, line 25	1-3,5,8, 29,31-33
A		34-36
A	EP 0 354 601 A (PIONEER ELECTRONIC CORP) 14 February 1990 see the whole document	1,4,6,8, 13-15, 29,30

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 February 1999	04/03/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Annibal, P

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International Application No
PCT/IL 98/00535

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/IL 98/00535

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